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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/753,662
Filing Date: January 04, 2001
Appellant(s): FUJIMURA ET AL.

Marc S. Weiner
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11/21/2003.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The brief does not contain a statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief. Therefore, it is presumed that there are none. The Board, however, may exercise its discretion to require an explicit statement as to the existence of any related appeals and interferences.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The rejection of claims 1-3 and 11 and claim 4 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,554,219	***Fukuda et al.***	***9-1996***
6,273,969 B1	***Dutta et al.***	***8-2001***
5,603,763	***Taniguchi et al.***	***2-1997***

Kingery, W.D., Introduction to Ceramics, 2nd ed., John Wiley and Sons, New York, New York, pp. 328-346, 1976.

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim 1-3, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda et al. (US 5,554,219) in view of Dutta et al. (US 6,273,969 B1) and Kingery et al. (Introduction to Ceramics, Second Ed., John Wiley & Sons, New York, USA, pp. 328-346, 1976.)

Fukuda et al. discloses a process for the production of bulk single crystal ZnSe (zinc selenide). Zn Se is disclosed in the first sentence of col. 1 as a known semiconductor used in, for example, lasers. The background in the same column stresses the need to avoid twinned (i.e. poly-crystal) growth during the production of bulk monocrystals of ZnSe. In lines 18-29 and 44-57 is delineated the process. A VF (vertical Bridgeman as in the claims) or a VGF (vertical gradient freezing) furnace was used. A crucible was used to contain the melt

within the vertical furnace. The raw material was melted and then a portion at the lower tip of the crucible was solidified by cooling. The crystal growth was then stopped. Then part of the resultant poly-crystalline ZnSe in the crucible tip was remelted. Then, from the lower surface of the melt in contact with the remaining solid raw material, crystallization was resumed by cooling the melt by moving the crucible down at a certain rate. The result was twin-free bulk ZnSe. The examiner notes that nuclei are the art accepted points at which crystal growth is initiated.

Fukuda et al. does not explicitly disclose the nucleation as promoted by the solid raw material or the use of an encapsulant.

Dutta et al. discloses the method for making alloys of semiconductors including ZnTe, ZnSe, CdTe, CdSe (col. 4 lines 49-56) by VF methods including the use of an encapsulant including boric oxide (B_2O_3). The encapsulant prevents the vaporization of a volatile component of the melt.

Kingery et al. discloses the basic and expected nature of the stages of crystal growth including nucleation and growth (see page 328 and 336).

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the above references because thereby the growth using a VF method would produce an semiconductor alloy of constant stoichiometry due to the prevention of vaporization. In addition, one of ordinary skill would have used the universally accepted nucleation/growth of Kingery et al. in order to understand the crystal formation that would have been expected to be

achieved with the Fukuda et al. and Dutta et al. combined process because both have crystal growth. Without nucleation one of ordinary skill in the art would not have expected crystal growth.

It would have been obvious to one of ordinary skill in the art at the time of the present invention that, in a crucible existing in a vertical furnace in which a raw material had been melted and in which existed a solid portion of raw material which was yet not a seed crystal as per claim 1, crystal growth of a compound semiconductor single crystal would have occurred because such is described by Fukuda et al in embodiment 5.

It would have been further obvious to one of ordinary skill in the art at the time of the present invention that the crystal growth occurred from nuclei existing at the surface of the solid raw material adjacent to the raw material melt because such growth occurred in Fukuda et al. and would have been consistent with the art accepted 'nucleation/growth' hypothesis of crystal growth presented by Kingery et al..

It would have been further obvious to one of ordinary skill in the art at the time of the present invention to use B_2O_3 as the encapsulant for a ZnTe or CdTe VF crystal growth method because such is suggested by Dutta et al. Dutta et al. discloses that VF methods are interchangeable for growing ZnSe, ZnTe, and CdTe.

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda et al. and Dutta et al. as applied to claims 1-3, 11 above, and further in view of Taniguchi et al. (US 5,603,763).

The combination is described above.

The combination does not disclose nucleation on the top surface of the melt.

Taniguchi et al. discloses the formation of CdTe by a VF method of crystal growth. In col. 12 15-30, it is disclosed that the nuclei are formed only on top of the melt away from the crucible wall and thus single crystals are easily obtained. Taniguchi et al. uses a controlled atmosphere (Cd vapor) to control surface volatilization of Cd.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the methods above because the atmosphere controlled method represented by Fukuda et al. and Dutta et al. is then protected from polycrystal (i.e. twin) formations. The substitution of one way of atmosphere control (encapsulant) for another (Cd vapor atmosphere) would have been obvious to one of ordinary skill.

(11) Response to Argument

The appellant's arguments (starting page 5) from the Supplemental Brief of 11/21/2003 have been considered but are not convincing.

The argument that there is no prima facie case of obviousness because each and every limitation is not covered by the references is not convincing. First, the characterization that "a large number of nuclei are generated " (page 9, 2nd para., first and second line) in effect admits that the required nucleation occurs in Fukuda although the reference does not explicitly mention nucleation. The examiner does understand the process of Fukuda et al. and contends that the steps outlined on pages 8 and 9 (last para.) attributed to Fukuda et al. are more limited than those of claim 1.

In response to appellant's argument that the references fail to show certain features of appellant's invention, it is noted that the features upon which appellant relies (i.e., nucleation occurs at the top surface of the melt just below the encapsulant) are not recited in the rejected claim 1. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Claim 4 does add this limitation. The appellant's claim 1 in step e) merely promotes growth on a surface of a raw material melt by leaving a solid raw material in the a part of the raw material melt. The appellant's Fig. Attached to the Brief merely shows one possibility of "a" surface on which nucleation occurs. Fukuda et al. 5th embodiment suggests another such surface for nucleation.

In response to appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208

USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The references are combined as above with motivations as above.

The argument that no showing of motivation was made is false. Dutta explains that the encapsulant is used to ensure compositional stability of the melt since the components are extremely volatile at the temperature used in the process. Motivation, as described before, is a desire to ensure consistency from one run of the process to the next in terms of stoichiometry – a very definite advantage when speaking of semiconductor materials. Kingery et al. discloses the basic steps of crystal growth processes from melts including nucleation and growth. Kingery et al. was added to show the conventional knowledge in the art as concerning crystal growth. Also, Kingery et al. counters the argument that because Fukuda et al. does not explicitly disclose nucleation , no such nucleation would occur.

The obvious to try argument is not convincing. Dutta et al. discloses encapsulated VF growth of the specific compounds used by appellant. Why using the same encapsulant in a modified VF process to ensure stoichiometry is not at least suggested to one of ordinary skill in the art is not immediately apparent.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

MAA
February 2, 2005

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